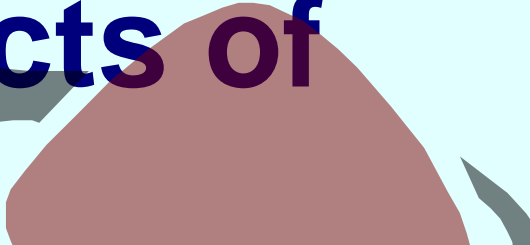


# A Small Dose of <sup>TM</sup> Lead

## An Introduction To The Health Effects of Lead



**Pb**

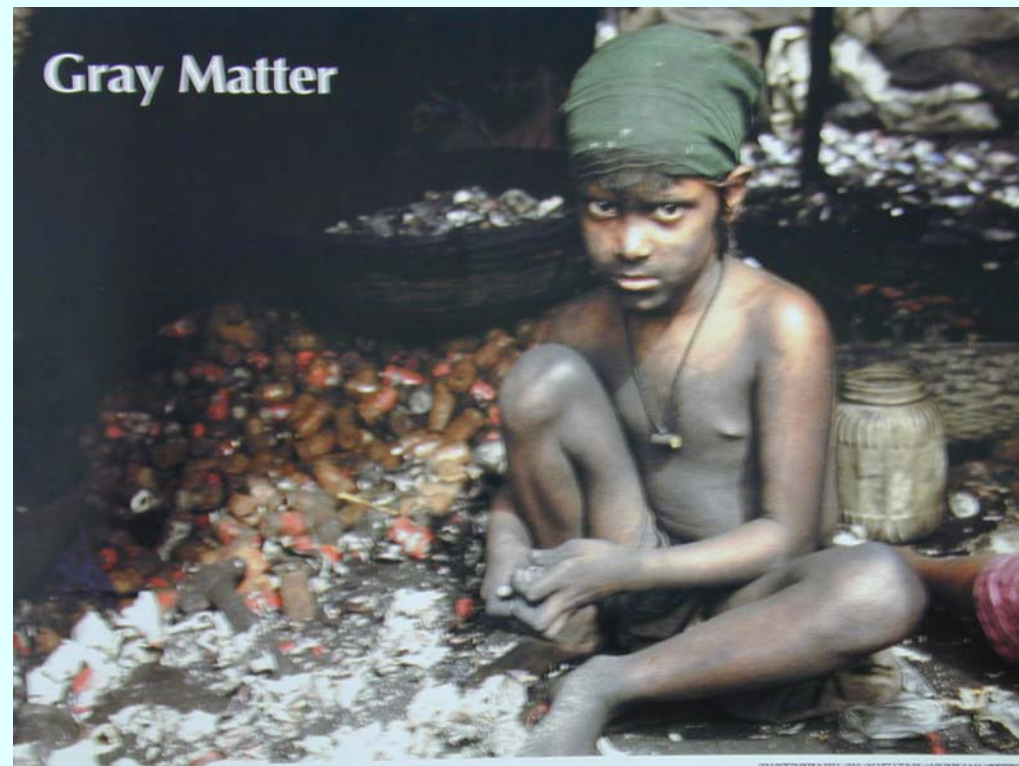
Lead

Atomic Number: 82

Atomic Mass: 207.20

Steven G. Gilbert, PhD, DABT  
“A Small Dose of Toxicology”  
[www.asmalldoseof.org](http://www.asmalldoseof.org)

# Child Health



# Effects of Amount on Response



# Effects of Size on Response



# A Small Dose of Lead

Pb

Lead

Atomic Number: 82

Atomic Mass: 207.20



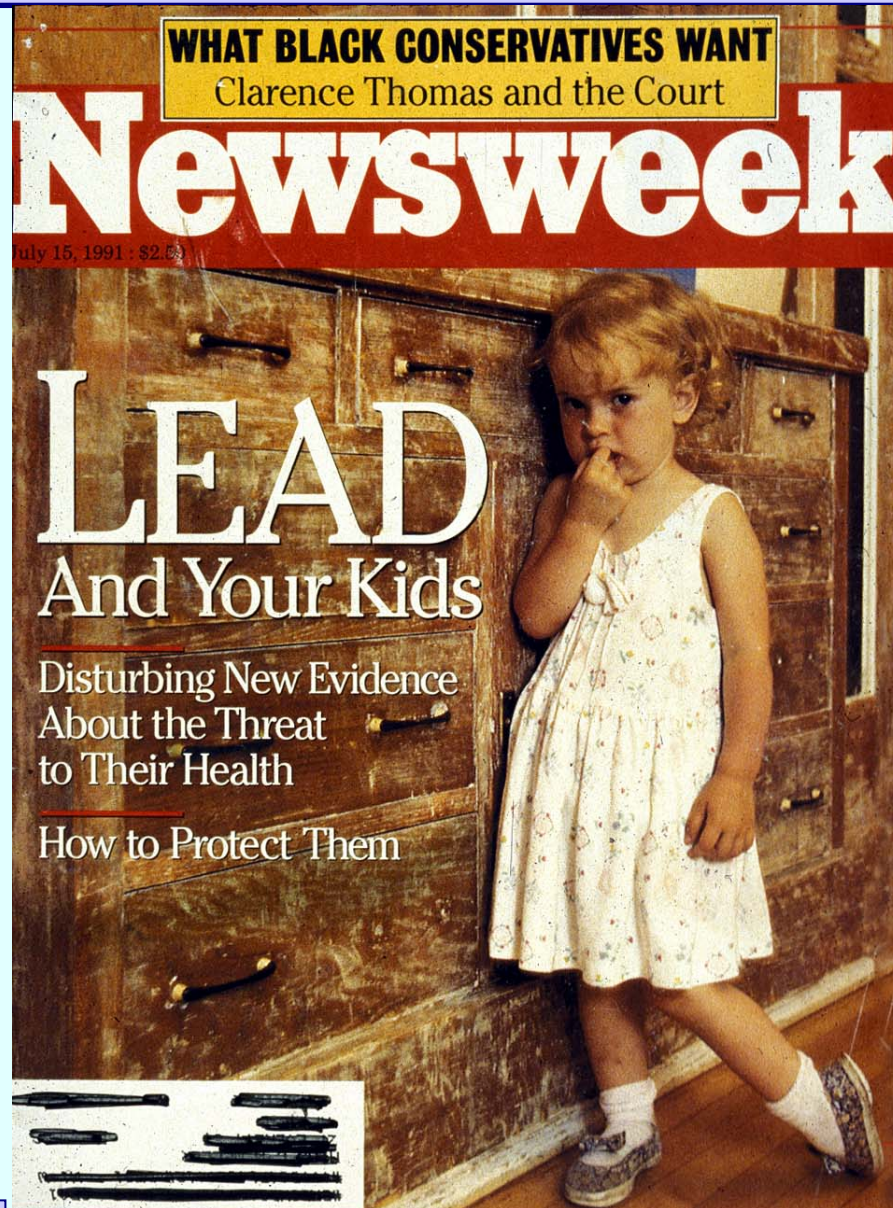
# Lead History

**Lead Makes the Mind  
Give Way**

**Greek 2<sup>nd</sup> BC**



# Lead In Homes



# Lead History

- 6500 BC. - Lead discovered in Turkey, first mine.
- 500 BC-300 AD.- Roman lead smelting produces dangerous emissions.
- 100 BC. - Greek physicians give clinical description of lead poisoning. “Lead makes the mind give way.”
- 1904 - Child lead poisoning linked to lead-based paints.
- 1922 - League of Nations bans white-lead interior paint; U.S. declines to adopt
- 1923 - Leaded gasoline goes on sale in selected markets
- 1971- U.S. Lead-Based Paint Poisoning Prevention Act passed
- 1923 - Leaded gasoline goes on sale in selected markets
- 1986 - Primary phase out of leaded gas in US completed





# Lead in Families





# Lead Based Paint Products



# Sources Of Lead

- **Lead Paint**
- **Dust, Soil**
- **Water**
- **Industry**
- **Hobbies**
- **Traditional Ethnic Remedies**



# Health Effects

- **Encephalopathy**
- **Colic**
- **Frank Anemia**
- **Hemoglobin Synthesis**
- **Peripheral Neuropathies**
- **Infertility (MEN)**
- **Systolic Blood Pressure (MEN)**
- **Nerve Conduction Velocity**
- **Erythrocyte Protoporphyrin**
- **DEVELOPMENTAL TOXICITY**
- **IQ, Memory, Learning**
- **Growth**



# Take Home Lead Exposure

**California, 1998**

**Lead poisoning in furniture workers  
and their families**

**Father 46  $\mu\text{g}/\text{dL}$**

**18-month-old child BLL 26  $\mu\text{g}/\text{dL}$**

**4-month-old daughter BLL 24  $\mu\text{g}/\text{dL}$**

**two refinishers BLLs of 29 and 54  $\mu\text{g}/\text{dL}$ ,  
the four carpenters BLLs of 46, 46, 47, and 56  $\mu\text{g}/\text{dL}$ .**

**MMWR - April 06, 2001 / 50(13);246-8**



# **Lead Contaminated Town**

## **Herculaneum, Missouri**

**Doe Run – Lead smelter**

**160,000 tons of lead per year**

**One of the largest lead smelters in US**

**Past over 800 tons of lead released into the environment as part of the smelting process.**

**Reduced to 81 tons in 2001**

**Target is 34 tons in 2002.**

**NY Times, Jan 19, 2002**



# Lead Out of Gasoline

**1990 – lead removed from Gasoline**

**Between 1976 and 1994, the mean blood lead concentration in children dropped from 13.7 mcg/dL to 3.2 mcg/dL**

**One of the major public health triumphs of the 20th century**



# Lead in Jewelry



<http://www.leadinspector.com/>





# Children Vulnerability

**CHILDREN are more vulnerable  
exposure than ADULTS**

**Size**

**Consume More Food**

**Inhale More Air**

**Developing Nervous System**

**Increased need for Calcium**



# **Lead - Absorption**

**Orally Consumed Lead Absorbed  
In Place of Calcium**

**CHILDREN – 30-50% OF LEAD**

**ADULTS – 5-10% OF LEAD**

**Increased During Pregnancy**



# Half-life Of Lead

- **25 DAYS -- BLOOD**
- **40 DAYS -- SOFT TISSUE**
- **20 YEARS -- BONE**



# Lead - Nutrition

**NUTRITIONAL DEFICIENCIES INCREASE  
ABSORPTION**

**(high fat diets, iron, calcium)**

**VITAMIN D (from sun) INCREASES**



# Children Vulnerability

**CHILDREN are more vulnerable  
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**Size**

**Consume More Food**

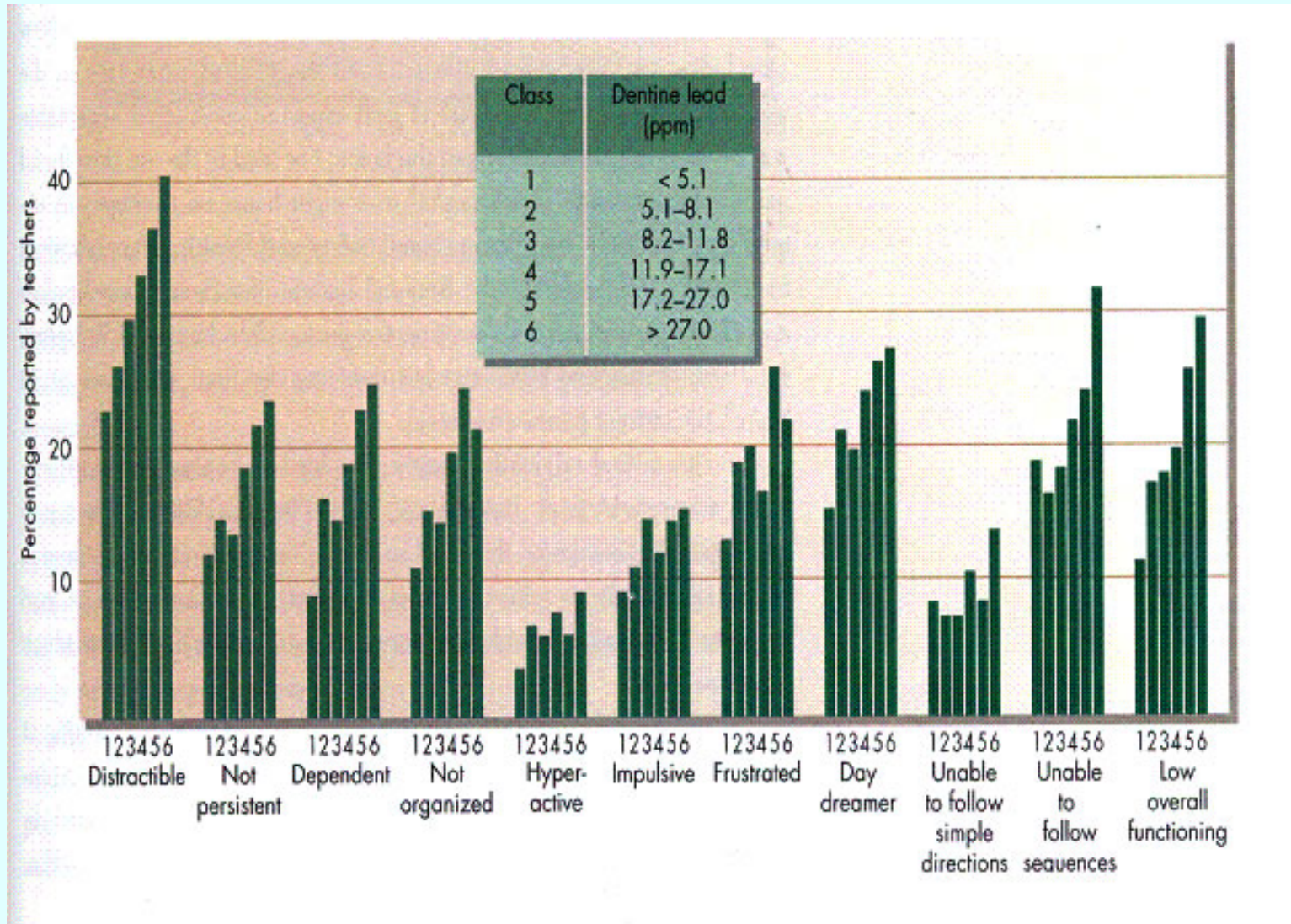
**Inhale More Air**

**Developing Nervous System**

**Increased need for Calcium**



# Mental Health Problems in Children

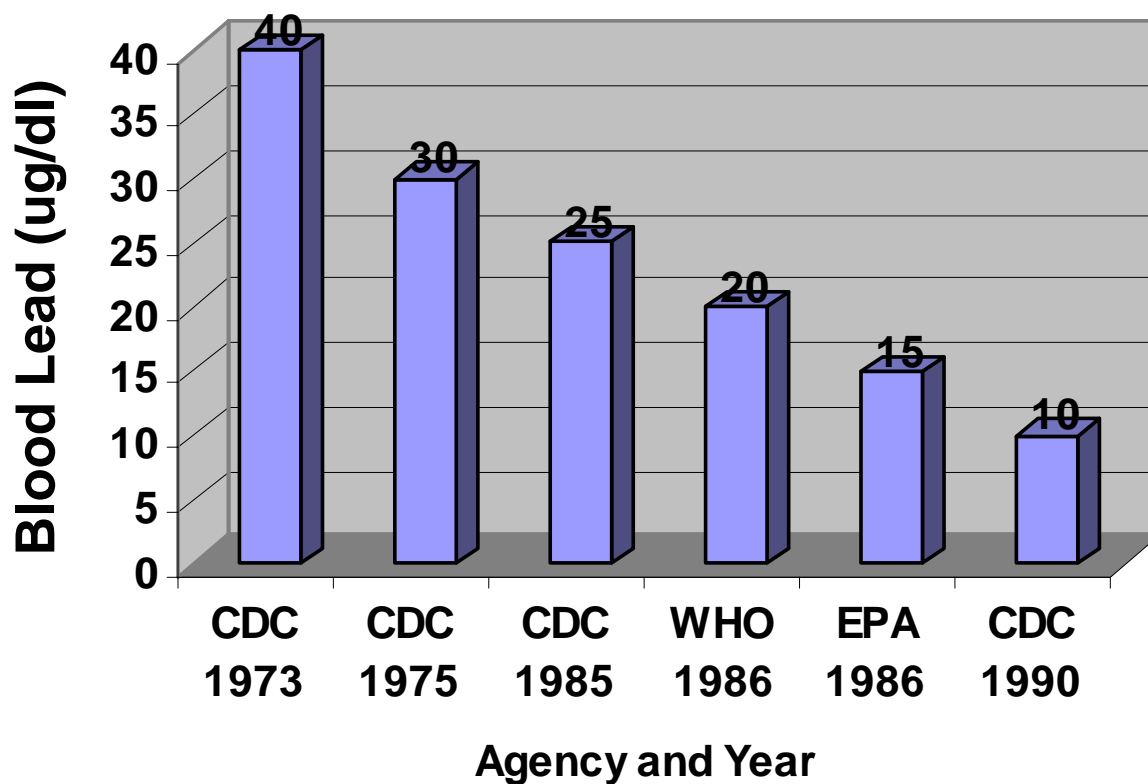


Needleman HL, et al. NEJM 1979;301:163.



# CDC Blood Lead Levels

**Acceptable Childhood Blood Lead Levels**



# Childhood Lead Exposure

## -- LONG TERM PROBLEMS --

- LOW GRADES •
- ABSENTEEISM •
- READING DISABILITY •
- HIGH SCHOOL DROP OUT •





# Academic & Social Costs Of Lead Exposure

- **Increased risk of not graduating from high school (rr 4.8)**
- **Poorer reading scores**
- **Increased evidence of depression**
- **Higher rate of hard drug use**
- **Increased risk for attention deficit disorder**
- **Increased risk for antisocial behavior**



# Reproductive Effects Of Lead

## WOMEN

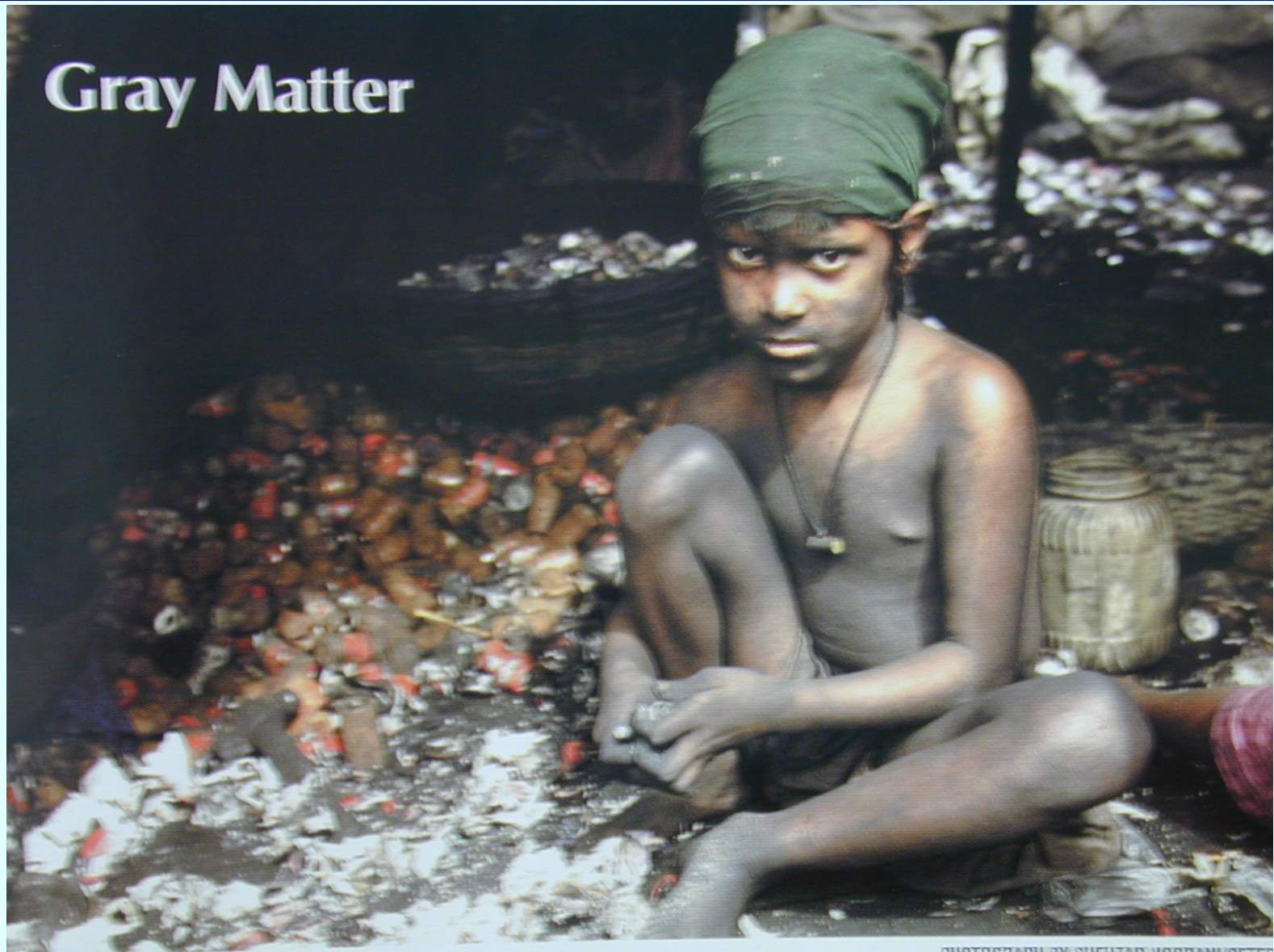
- lead crosses the placenta
- low infant birth weight
- retarded mental development
- miscarriages
- premature birth
- stillbirth

## MEN

- decreased sex drive
- impotence
- sterility
- altered sperm-birth defects



# Recycling Lead




PHOTOGRAPH BY CHEUK TAN HONG/AMH/DET



# Principles of Toxicology



# Additional Information

- 
- **A Small Dose of Toxicology**
  - **[www.asmalldoseof.org](http://www.asmalldoseof.org)**



# Authorship Information

**This presentation is supplement to  
“A Small Dose of Toxicology”**

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